

Amendments to the Drawings

The attached replacement sheet of drawings includes changes to Figure 3. This sheet replaces the original sheet. In the corrected sheet, the individual figures have been labeled 3A-3D in accordance with the description at paragraph [0059], pages 14-15 of the application as filed. The overall caption "Figure 3" has also been deleted. No new matter has been added.

REMARKS

Prior to entry of this amendment, claims 1-2, 4-15, 18-21 and 41-42, 46-54, 56-60, and 62-72 were pending in the application, with claims 19-21 being withdrawn from consideration. This amendment cancels claims 1, 4-7, 41-42, 46-50, 53, 56-60, 62-63, 65, 67-68 and 70-72 and adds new dependent claims 73-77.

In response to the pending Office Action of August 13, 2009, Applicants present the following arguments and amendments. The present amendments are requested solely for the purpose of more clearly describing and claiming the present invention and do not introduce any new matter. Applicants reserve the right to pursue the subject matter of the claims as originally presented. Applicants submit that in light of the arguments presented and amendments requested, this application is in condition for allowance. Accordingly, entry of these amendments, reconsideration of all pending rejections and objections, and passage to allowance is respectfully requested.

The Amendments to the Claims

Please cancel claim 1 without prejudice.

Claim 2 has been amended to depend from claim 64 rather than deleted claim 1.

Please cancel claims 4-7 without prejudice.

Claim 8 has been amended to depend from claim 64 rather than deleted claim 1.

Claims 13 and 15 have been amended to depend from claim 64 rather than deleted claim 1.

Claim 18 has been amended to depend from been amended to depend from claim 64 rather than deleted claim 1.

Please cancel claims 41-42 and 46-50 without prejudice.

Claim 51 has been amended to depend from claim 64 rather than deleted claim 1.

Claim 52 has been amended to depend from claim 64 rather than deleted claim 41; the limitation that the nanofilm adheres to the substrate has been eliminated as duplicative.

Please cancel claim 53 without prejudice.

Claim 54 has been amended to depend from claim 66 rather than deleted claim 41.

Please cancel claims 56-60 and 62-63 without prejudice.

Claim 64 has been rewritten in independent form to specify that the electrode for a secondary electrochemical cell comprises a substrate and a layer of nanostructured framework material which adheres to the substrate, the framework material being in the form of an amorphous nanofilm and being silicon-germanium of formula $\text{Si}_{(1-z)}\text{Ge}_z$, wherein z is from 0.25 to 0.75. The limitation that the electrolyte contains a lithium salt has also been deleted. The limitation that the electrode comprises a substrate is supported by original claim 17 and by para. [0059], pages 14-15 of the specification as filed. The limitation that the electrode comprises a layer of nanostructured framework material which adheres to the substrate is supported by the description at para. [0059], page 15, lines 2-4 of the specification as filed. The limitation that the nanostructured material is in the form of an amorphous nanofilm is supported by para. [0057],

pages 13-14. The limitation that the nanostructured framework material is silicon-germanium of formula $\text{Si}_{(1-z)}\text{Ge}_z$, wherein z is from 0.25 to 0.75 is believed to be supported by paras. [0047], page 10 and paras. [0091]-[0092], page 25 (Example 9).

Please cancel claim 65 without prejudice.

Claim 66 has been rewritten independent form to specify that the electrode for a secondary electrochemical cell comprises an alkali metal alloy of a nanostructured silicon-germanium material of formula $\text{Si}_{(1-z)}\text{Ge}_z$, wherein z is from 0.25 to 0.75, the alkali metal alloy being produced by electrochemically alloying an alkali metal with an amorphous nanofilm of the nanostructured material of formula $\text{Si}_{(1-z)}\text{Ge}_z$. The limitation that the electrolyte contains a lithium salt has also been deleted. The limitation that the electrode comprises an alkali metal alloy produced by electrochemically alloying an alkali metal with a nanostructured silicon-germanium alloy is supported at para. [0024], page 5 and para. [0042], page 8 of the specification as filed. The limitation that silicon-germanium is of formula $\text{Si}_{(1-z)}\text{Ge}_z$, wherein z is from 0.25 to 0.75 is supported by paras. [0047], page 10 and paras. [0091]-[0092], page 25 (Example 9). The limitation that the nanostructured silicon-germanium is an amorphous nanofilm is supported by para. [0057], pages 13-14.

Please cancel claims 67-68 without prejudice.

Claim 69 has been amended to depend from claim 66 rather than deleted claim 68.

Please cancel claims 70-72 without prejudice.

New claim 73 depends from claim 64 and specifies that the silicon-germanium material is a solid solution. This claim is believed to be supported by para. [0046], page 9 and para. [0092], page 25 of the application as filed.

New claim 74 depends from claim 64 and specifies that the silicon-germanium material is not homogeneous. This claim is believed to be supported by para. [0047], page 9 of the application as filed.

New claim 75 depends from claim 66 and specifies the silicon-germanium material is a solid solution. This claim is believed to be supported by para. [0046], page 9 and para. [0092], page 25 of the application as filed.

New claim 76 depends from claim 66 and specifies that the silicon-germanium material is not homogeneous. This claim is believed to be supported by para. [0047], page 9 of the application as filed.

New claim 77 depends from claim 66 and specifies that the alkali metal is lithium and the lithium alloy has the formula $\text{Li}_x\text{Si}_{(1-z)}\text{Ge}_z$, wherein x is at least about 1. This limitation is believed to be supported by original claim 11.

No new matter has been added by these amendments.

The Drawing Objection

The drawings were objected to because not all of the figures were labeled as such in Figures 3A-3D. The rejection is believed obviated by the submission of a replacement drawing sheet to add the missing labels. Reconsideration and withdrawal of the objection is requested.

The Claim Objections

The objection to claim 72 is believed to be obviated by cancellation of this claim. Reconsideration and withdrawal of the rejection is requested.

The Rejection Under 35 U.S.C. 112

Claims 1, 2, 7-15, 18, 51 and 63-66 were rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. Applicants note that claims 1, 7, 63, and 65 have been canceled, claim 64 has been rewritten in independent form and that claims 2, 8-15, and 51 now depend from independent claim 64 rather than claim 1. The limitation that "only one layer of framework material is present in the electrode", which the Office Action asserted to be new matter, is no longer incorporated in claims 2, 8-15, 51 or 64.

The Office Action asserted that the recitation of "lithium salt" in claims 64 and 66 was new matter. To advance prosecution, this term has been deleted from claims 64 and 66.

In view of these amendments, Applicants request reconsideration and withdrawal of the 35 U.S.C. 112 rejection of claims 2, 8-15, 51, 64 and 66.

The Rejections Under 35 U.S.C. 102(b)

Saitoh et al.

Claims 1, 4-6, 8-10, 13-15, 46-51, 63, 67, 70 and 71 were rejected under 35 U.S.C. 102(a)/(e) as being anticipated by U.S. Pre-Grant Publication No. 2003/0165697 to Saitoh et al. (hereinafter Saitoh). Applicants note that claims 1, 4-6, 46-50, 63, 67, 70 and 71 have been canceled, therefore the rejection of these claims is believed to be obviated.

Claims 8-10, 13-15 and 51

The Saitoh reference fails to teach all the limitations of amended claim 8, claims 9-10, amended claim 13, claim 14 and amended claims 15 and 51, all of which now depend either directly or indirectly from amended claim 64. Amended claim 64, and thereby claims 8-10, 13-15 and 51, contains the limitations that the electrode is the anode of a secondary electrochemical cell comprising an anode, a cathode and an electrolyte and the framework material of the electrode

comprises a layer of nanostructured framework material, the framework material being in the form of an amorphous nanofilm and silicon-germanium material of formula $\text{Si}_{(1-z)}\text{Ge}_z$, wherein z is from 0.25 to 0.75. Saitoh teaches use of crystalline material, rather than amorphous material, does not teach the specified Si-Ge composition range, and does not teach that his semiconductor crystal is used as a framework material for a battery electrode in an electrochemical cell also comprising a cathode and an electrolyte. In view of all the foregoing, Saitoh does not teach all the limitations of amended claim 64 or claims 8-10, 13-15 or 51. Reconsideration and withdrawal of the rejection of claims 8-10, 13-15 or 51 is requested.

The Rejections Under 35 U.S.C. 103(a)

Saitoh in view of Fitzgerald

Claim 7 was rejected under 35 U.S.C. 103(a) as being unpatentable over Saitoh further in view of U.S. Pre-grant Publication No. 2002/0123183, hereinafter Fitzgerald. Claim 7 has been canceled therefore the rejection of this claim is believed to be obviated.

Kusumoto in view of Zhou

Claims 41, 42, 46-50, 52, 53, 56-59, 62 and 65-72 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pre-Grant Publication No. 2003/0054252, hereinafter Kusumoto, in view of WO 01/96847, hereinafter Zhou. Claims 41-42, 46-50, 53, 56-59, 62, 65, 67-68, and 70-72 have been canceled; therefore the rejection of these claims is believed to be obviated.

Claim 52

The Kusomoto and Zhou references, either singly or in combination, fail to teach all the limitations of amended claim 52. Amended claim 52 depends from and incorporates all the limitations of Claim 64. Amended claim 64, and thereby amended claim 52, contains the limitations that the electrode is the anode of a secondary electrochemical cell comprising an anode, a cathode and an

electrolyte and the framework material of the electrode is in the form of an amorphous nanofilm and is silicon-germanium material of formula $\text{Si}_{(1-z)}\text{Ge}_z$, wherein z is from 0.25 to 0.75. The Kusomoto and Zhou references, either singly or in combination, fail to teach electrodes with amorphous nanofilms of silicon-germanium material of formula $\text{Si}_{(1-z)}\text{Ge}_z$, wherein z is from 0.25 to 0.75.

In addition, the attached declaration of J. Graetz provides evidence that electrodes with amorphous nanofilms of silicon-germanium framework material of formula $\text{Si}_{(1-z)}\text{Ge}_z$, wherein z is from 0.25 to 0.75 displayed improved performance over electrodes with amorphous nanofilms of silicon framework material. In particular, the nanofilms of silicon-germanium framework material showed reduced capacity loss over the discharge rate range 0.04 to 1 C or 0.04 to 5 C as compared to a nanofilm of silicon framework material. Therefore, the capacity of these nanostructured Si-Ge materials was more stable with increasing discharge rate than nanostructured Si over the specified range. In addition, a nanofilm of a 25% Ge 75% Si alloy showed reduced capacity loss with increasing cycle number as compared to a silicon nanofilm. The attached declaration of J. Graetz also provides evidence that the improved capacity stability of these Si-Ge materials is unexpected in view of the teachings of the Zhou and Kusomoto references.

In view of all the foregoing, reconsideration and withdrawal of the rejection of claim 52 is requested.

Claims 66 and 69

The Kusomoto and Zhou references, either singly or in combination, fail to teach all the limitations of claims 66 and 69. Amended claim 66 contains the limitation that the electrode is the anode of a secondary electrochemical cell comprising an anode, a cathode and an electrolyte and the electrode comprises an alkali metal alloy of nanostructured material of formula $\text{Si}_{(1-z)}\text{Ge}_z$ wherein z is from 0.25 to 0.75 where the alkali metal alloy is produced by electrochemically alloying an

alkali metal with an amorphous nanofilm of the nanostructured material.

Amended claim 69 depends from and incorporates all the limitations of claim 66. The Kusomoto and Zhou references, either singly or in combination, fail to teach electrodes comprising an alkali metal alloy of nanostructured material of formula $\text{Si}_{(1-z)}\text{Ge}_z$ wherein z is from 0.25 to 0.75. In addition, the attached declaration of J. Graetz provides evidence of improved electrochemical performance, as compared to electrochemically synthesized lithium alloys of amorphous nanofilms of silicon framework material, for electrochemically synthesized lithium alloys of amorphous nanofilms of silicon-germanium framework material of formula $\text{Si}_{(1-z)}\text{Ge}_z$, wherein z is from 0.25 to 0.75. In view of all the foregoing, reconsideration and withdrawal of the rejection of claims 66 and 69 is requested.

Kusumoto in view of Zhou and Kriesel

Claims 54 and 60 were rejected under 35 U.S.C. 103(a) as being unpatentable over Kusumoto in view of Zhou as applied to claims 41 and 42 above, and further in view of U.S. Pre-Grant Publication No. 2004/0106741, hereinafter Kriesel. Claim 60 has been canceled, therefore its rejection is believed to be obviated.

Claim 54

Amended claim 54 depends from and incorporates all the limitations of claim 66. The Kusomoto, Zhou and Kriesel references, either singly or in combination, fail to teach all the limitations of amended claim 66. Amended claim 66, and therefore amended claim 54, contains the limitation that that the electrode is the anode of a secondary electrochemical cell comprising an anode, a cathode and an electrolyte and that the electrode comprises an alkali metal alloy of nanostructured material of formula $\text{Si}_{(1-z)}\text{Ge}_z$ wherein z is from 0.25 to 0.75. The Kusomoto, Zhou and Kriesel references, either singly or in combination, fail to teach these limitations. Reconsideration and withdrawal of the rejection of claim 54 is requested.

The New Claims

Claims 73-74 depend from and incorporate all the limitations of claim 64, which is believed to be patentable over the references of record.

Claims 75-77 depend from and incorporate all the limitations of claim 66, which is believed to be patentable over the references of record.

Conclusion

All claims being in condition for allowance, passage to issuance is respectfully requested. Applicants hereby request that an extension of time be granted for the filing of this response. It is believed that a fee of \$555, for a three months extension of time, is due with this submission. It is believed that no claims fees are due since the number of dependent claims canceled in this response exceeds the number of dependent claims added and the number of independent claims added equals the number of independent claims canceled. If the amount submitted during EFS filing of this response is incorrect, please charge any deficiency or credit any overpayment to deposit account 07-1969.

Respectfully submitted,

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